

### **REMARKS**

Claims 1, 2, 6-22 and 24-26 are all of the claims presently pending in the application. Claims 1, 6 and 22 have been amended to more particularly define the claimed invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Applicant appreciates the Examiner's indication that claims 8, 10, 11, 18, and 20 would be allowable if rewritten in proper independent form. Applicant submits, however, that all of claims 1-2, 6-22 and 24-26 are allowable over the cited prior art references.

Claims 1, 2, 6, 7, 9, 12-17, 19, 21, 22 and 24-26 stand rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as obvious over Tadamoto (Jpn. J. Appl. Phys., Vol. 40, pp. L583-L585, Part 2 No. 6B, "High Output Power InGaN Ultraviolet Light-Emitting Diodes Fabricated on Patterned Substrates Using Metalorganic Vapor Phase Epitaxy", 15 June 2001).

These rejections are respectfully traversed in the following discussion.

#### **I. THE CLAIMED INVENTION**

The claimed invention (e.g., as defined by exemplary claim 1) is directed to a III group nitride system compound semiconductor light emitting element. The light emitting element includes a transparent substrate, a III group nitride system compound semiconductor formed on a surface of the transparent substrate and a convex light trapping member that is formed over the surface of the transparent substrate. An interface is provided between the light trapping member and the transparent substrate (e.g., see Application at page 9, lines 27-29 and Figures 1B to 1F, 2, 3, and 5A).

The interface between the light trapping member and the transparent substrate is illustrated by a line in Figures 1B to 1F, 2, 3, and 5A that represents an interface between the sapphire substrate (1) and the light trapping member (2, 7 or 8).

Furthermore, the Application discloses that the light trapping member (2) is laminated on the sapphire substrate (1) (see Application at page 9, lines 27-29). It is well known to those skilled in the art that when one member is laminated on another member a certain interface exists between the two members. Thus, the word "laminated" means that there is an interface between the sapphire substrate (1) and the light trapping member (2).

Still further, the Application discloses that the light trapping member is formed independently of the substrate (see Application at page 5, lines 14-16). Thus, the word "independently" also teaches that there is an interface between the sapphire substrate (1) and the light trapping member (2).

The claimed invention, of exemplary claim 1, provides a light trapping member having a high degree of freedom in designing since it is formed independently of the substrate (see Application at page 9, lines 11-13). The Application states that as a result, "[f]or example, even when the height of the light trapping member increases, by providing the light trapping member with an inclined plane, a III group nitride system compound semiconductor layer with a good crystal quality can be formed on the substrate without generating a cavity in the concave portion between light trapping members" (see Application at page 9, lines 14-19).

## II. THE PRIOR ART REFERENCE

The Examiner alleges that Tadamoto teaches the claimed invention of claims 1, 2, 6, 7, 9, 12-17, 19, 21, 22 and 24-26. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Tadamoto.

That is, Tadamoto (described on pages 2-3 of the Application) does not teach or suggest "*wherein an interface is provided between the light trapping member and the transparent substrate*" as recited in independent claim 1, and similarly in independent claims 6 and 22.

The Examiner asserts that Tadamoto teaches sapphire which he indicates is aluminum oxide (specifically  $\text{Al}_2\text{O}_3$ ). He asserts that Tadamoto shows a sapphire substrate with "convex" projections (allegedly convex light trapping members) upon which is grown a GaN

based light-emitting member.

Nowhere does Tadamoto teach or suggest that the convex light trapping member wherein an interface is provided between the light trapping member and the transparent substrate. Indeed, the Examiner does not even allege that Tadamoto teaches or suggests this feature.

Tadamoto discloses that a "patterned sapphire substrate (PSS)" is fabricated by photolithography and reactive ion etching (RIE), and that, as the result of the fabrication, the PSS is provided with ridges and grooves (see Tadamoto at page 2, fifth paragraph).

However, the PSS of Tadamoto is not provided with any interface between the ridge and the sapphire substrate. Namely, it is impossible for the PSS to have such an interface since the ridge of the PSS is formed by patterning the surface of the sapphire substrate by etching, i.e., the ridge continues in material from the substrate body.

As compared to the device of the claimed invention, the PSS of Tadamoto exhibits a disadvantage. That is, the Application teaches that "sapphire, which is commonly used as transparent substrate material, is difficult to process since it is hard and fragile. In other words, it limits the degree of freedom in forming the uneven pattern on the surface" (see Application at page 3, lines 13-16).

It is apparent that the claimed invention is not anticipated by Tadamoto since Tadamoto fails to disclose that there is an interface provided between the light trapping member and the transparent substrate.

Moreover, the claimed invention of exemplary claim 1 recites "a convex light trapping member that is formed over a surface of the transparent substrate". In contrast, Tadamoto teaches a sapphire substrate having a pattern formed on a surface thereof.

Applicants have discovered, as indicated in the discussion of Tadamoto on pages 2-3 of the Application, that it is difficult to grow a semiconductor layer with a good crystal quality on the entire surface of the wafer. Therefore, the patterning of the substrate causes a reduction in yield and an increase in the manufacturing cost of the light emitting element.

Furthermore, when a Group III nitride compound semiconductor layer is grown in the groove formed by patterning, as is taught in Tadamoto, a cavity may be generated in the

grooves. This results in a large difference in the refractive index between the cavity and the group III nitride compound semiconductor layer. Thus, light emitted from semiconductor layer is reflected on the wall of the cavity, which results in a lower light extraction efficiency (see Application at page 2, line 3 through page 3, line 16).

Additionally, sapphire, which is used as the substrate material in Tadamoto, is difficult to process. This limits the degree of freedom in forming the pattern on the surface of the substrate.

In contrast, the claimed invention of exemplary claim 1, avoids the problems of Tadamoto by forming a convex light trapping member on the surface of the transparent substrate, as opposed to merely patterning the surface of the substrate, as taught by Tadamoto. This allows the claimed invention to enhance the light extraction efficiency of the device while preventing the occurrence of cavities between the light trapping members.

Therefore, Applicant submits that there are elements of the claimed invention that are not taught or suggested by Tadamoto. Therefore, the Examiner is respectfully requested to withdraw this rejection.

#### **IV. FORMAL MATTERS AND CONCLUSION**

In view of the foregoing, Applicant submits that claims 1, 2, 6-22 and 24-26, all of the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

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11

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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